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GEOGRAPHIC MEMORANDA

SPECIFIC GEOGRAPHIC ASPECTS OF THE SVOBODNYY AREA
CIA/RR-G/I 59-2

SUPPLEMENTARY GEOGRAPHIC INFORMATION ON THE MOZHAYSK AREA
CIA/RR-G/I 59-3

SUPPLEMENTARY GEOGRAPHIC INFORMATION
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SPECIFIC GEOGRAPHIC ASPECTS OF THE OLENEGORSK AREA
CIA/RR-G/I 59-5

13 January 1959

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

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GEOGRAPHIC MEMORANDUM

SPECIFIC GEOGRAPHIC ASPECTS OF THE SVOBODNY AREA

CIA/RR-G/I 59-2
13 January 1959

**CENTRAL INTELLIGENCE AGENCY
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CIA/RR-G/I 54-2
January 1959

SPECIFIC GEOGRAPHIC ASPECTS OF THE SVOBODNY AREA

The Problem Area, as defined for this study, includes the land in the immediate vicinity of a selected point at 51°15'N-128°00'E. The nearest city of importance is Svetodnyy, which is located on the Trans-Siberian Railroad 12 miles (19 kilometers) to the northeast; about 575 miles (600 kilometers) to the southeast is the city of Khabarovsk. Less than 2 miles (3 kilometers) to the southeast is the navigable Zeya River, a major tributary of the Amur. Twenty miles (32 kilometers) east-southeast of the Area, in the vicinity of Ukratina is one of the largest and most important military airfields in the Soviet Far East. Administratively, the Area is located within Amurskaya Oblast', about 70 miles (112 kilometers) north of the oblast center of Blagoveschensk. Farming is the main economic activity of importance in the vicinity of the Area. Agriculture is focused on grain farming mixed with cattle raising for milk and meat. To the east of the Area is the Zeya-Bureya Plain, one of the chief wheat producing regions in Soviet Far East.

The Area is situated along the eastern margin of the Amur-Zeya Plateau near its junction with the Zeya-Bureya Plain. In this vicinity the relief of the Amur-Zeya Plateau is characterized by a series of low eroded hills separated by narrow but relatively flat valleys. The absolute elevation of the plateau is between 1,000 and 1,300 feet (300 and 400 meters), and local relief ranges up to 650 feet (200 meters). Although specific geological data is not available for the Area, the eroded hills along the right bank of the Zeya are

largely outcrops of sandstone and ultrabasic rocks. Most of the plateau surface is covered by friable upper Cretaceous and Tertiary deposits consisting of neogenic sands interbedded with clay and shallow seams of lignite. The Tertiary deposits are reported to be approximately 500 feet (150 meters) thick along the steep banks of the Zeya River. Beneath these beds is Pre-Cambrian basement rock that outcrops in places along the Zeya Valley.

The Zeya-Bureya Plain east of the plateau is relatively flat to rolling, with absolute elevations ranging from 300 to 650 feet (90 to 200 meters). Most of the plain is covered by friable lacustrine and alluvial deposits of Tertiary and Upper Cretaceous age. In places, these beds are covered by thin Quaternary deposits.

Soils of the Area are primarily clayey and sandy loams of the turf-podzolic type. The turf-podzols are characterized by a profile with three distinct horizons: the "A" or turf horizon, the "B" or podzolic horizon, and the "C" or hardpan horizon. The total depth of the 3 horizons generally measures 43 to 60 inches (120 to 150 centimeters). The humus and ash elements accumulate in the "A" horizon, which is usually 8 to 12 inches (20 to 30 centimeters) thick. Beneath this layer is the light gray to white podzolic horizon, which may reach 24 inches (60 centimeters) in thickness. The "C" horizon consists of a yellow to red brown hardpan with a high concentration of iron oxide. The turf-podzols are usually well drained. The Area has a sparse forest cover consisting chiefly of black birches, oaks, and some Siberian stone pine. The hill slopes support scattered scrub growth.

Along the flood plain of the Zeya the podzols give way to turf-

meadow soils. In the boggier depressions are peaty-humus-bley soils. The meadow soils are dark colored, resembling the chernozems. These soils, however, are not typical black earths, since both the granular structure and the accumulation of carbonates are lacking. In their natural state, the meadow and peaty soils are covered by sedges, reeds, and an assortment of wet-meadow grasses. Where drier sandy soils border the river willows and wild cherry are found.

The Area is situated near the southern limit of the permafrost zone where only lenses of permafrost are encountered. Permafrost, therefore, would probably not cause any serious construction problems.

The Zeya River is the principal nearby hydrographic feature, as well as a good source of fresh water. Although a river gauging station is located at Malaya Sazanka, no useful hydrological data from this station have been made available. Since the mean annual discharge of the river is at the rate of 2,100 cubic meters per second at Mazanovo 76 miles (122 kilometers) upstream from Malaya Sazanka and 2,300 cubic meters per second at the river mouth 93 miles (149 kilometers) downstream, the rate of discharge near the Area should be approximately 2,200 cubic meters per second. No discharge data on a monthly basis are available.

Since the Zeya is fed mainly by rainfall (69 percent) and secondarily by melting snow (26 percent), the flow is subject to a high degree of seasonal variation. There are two high-water periods -- spring and late summer. The spring peak occurs in May and June, accompanying the melting of snow in the upper river basin. By the end of June or early July the water level subsides somewhat. The second and maximum period of high water occurs in August or early

September. During the peak periods, the river may rise 12 to 20 feet (4 to 6 meters) or more above the minimum level of winter, and floods are frequent. In 1953, high water flooded Surazhevka, a suburb of Slobodnyy. Floods of serious proportions, however, occur only once in 4 or 5 years.

Winter is the period of minimum flow, with the lowest level usually reached in March. The minimum flow of winter is at the rate of 105 cubic meters per second at Mazanovo and at the rate of 125 cubic meters per second at the mouth of the Zeya.

Ground water provides only 5 percent of the annual flow of the Zeya. Ground water in quantity is generally available at depths below 1,650 feet (500 meters), but in places may be as deep as 3,500 to 5,000 feet (1,000 to 1,500 meters). The water is relatively fresh, having a mineral content -- principally calcium carbonate -- of less than 1 gram per liter.

The climate of the Area has a clearly expressed monsoonal character. Nearly 65 percent of the annual precipitation falls during the 3 summer months of June, July, and August. In contrast to the short, warm, and humid summers, winters are long, cold, and relatively dry.

The cold winters are the result of heavy cold-air masses that drift from the higher inland regions towards the coast, following river valleys and other depressions. Winter lasts from early October to late April, with January generally the coldest month. The mean minimum temperature for this month is usually lower than -20°F. The Zeya River begins to freeze in the middle of October, and by the middle of November the river is generally frozen over. During the

freezing period, there is considerable movement of ice along the river. Snowfall is comparatively light. Mean depth of snow cover by 10-day periods is shown on the accompanying climatic tables.

Although spring is cool, mean temperatures rise sharply from April to May. By the end of April, thawing is widespread, and most of the snow cover has disappeared. The spring breakup of the river ice occurs at the end of April, but it is somewhat later in the upper reaches of the Zeya. The ice flow lasts 10 to 12 days and is usually accompanied by ice jams.

During the summer, precipitation usually reaches a maximum, but it has been known to vary from less than 1 inch to over 11 inches for July and for August at Blagoveshchensk. As much as 4.8 inches of rainfall have been recorded for a single 24-hour period in August. Maximum daytime temperatures in the 80's and low 90's ($^{\circ}\text{F}$) are not uncommon.

Fall, like spring, is a short transitional season. Temperatures and rainfall decrease sharply from September to October. The first frost of the season usually occurs by the middle of September, but daytime temperatures may often exceed 60 $^{\circ}\text{F}$.

The Area is served by a good network of rail, road, and water routes, and has access to air facilities. The most important route is the double-tracked Trans-Siberian Railroad, which passes through Svobodnyy in a northwest-southeasterly direction. Traffic on this line is heavy, with an estimated 18 to 21 freight trains each way per day. The bulk of the freight consist of coal, POL, agricultural products, and machinery. According to 1958 Soviet timetables, passenger traffic over the line numbers 7 trains each way per day plus an

additional train each way that operates on alternate days (Tues, Fri, Sat). Svobodnyy, a scheduled stop on the Trans-Siberian Railroad, is equipped with a railroad-car repair plant (known as Mikhaylo-Chesnokovskiy) and marshalling yards.

Most of the nearby roads radiate from the trading center and rail head of Svobodnyy. The main road between Svobodnyy and Blagoveshchensk parallels the west bank of the Zeya River and runs past the Area. Beyond Svobodnyy, the road continues northeastward along the east bank of the Zeya to Novo-Niyevka and thence along the Selendzha River for about 120 miles (300 kilometers) to Bator. There are no known road bridges spanning the Zeya, but ferries reportedly operate at Malaya Sazanka and Bol'shaya Sazanka, as well as at Vvedenovka, and Svobodnyy. During midwinter, the Zeya River can be easily crossed over the ice.

The Zeya serves as a useful water route for 160 to 170 days a year, from May to mid-October. Regular river steamers, barges, and motor launches navigate up the river to the town of Zeya, 312 miles (503 kilometers) beyond Malaya Sazanka, and also up the Selendzha for 83 miles (134 kilometers) to Norsk. During high water, smaller boats can navigate even beyond these points. Freight traffic on the Zeya consist chiefly of timber (70-80 percent), with grain, coal, and petroleum making up most of the remaining cargo. Boat landings are located at Malaya Sazanka, Bol'shaya Sazanka, at Moskvitino, farther downstream, and at Surazhevka (Svobodnyy) and Molchanovo upstream. Surazhevka also has a boat construction yard and wharves.

In addition to its rail-water transshipment and storage functions, Svobodnyy is the center for lumber operations, agricultural activities,

and several building materials plants (brick and cement). It is also reported to include two power stations and a number of military barracks. The latest population of Svobodnyy is 56,000, a significant increase from the prewar estimate.

Limited air facilities are located at Svobodnyy, but by far the most important airfield is near Uryana. Since 1953 the airfield has been greatly expanded and now has an 11,500-foot concrete runway capable of supporting both medium and heavy bombers. The airfield is supported by a network of ancillary facilities, including POL storage with a capacity of at least 2,000,000 gallons. A short spur line links the airfield with the Trans-Siberian Railroad 4 miles (6.4 kilometers) to the west-southwest.

CLIMATIC DATA

Blagoveshchensk
(50°10'N-127°38'E; Altitude, 440')

Temperature (in °F)	Approved For Release : CIA-RDP62-00680R000200190077-3											Period of Observation (years)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
App. Mean	-11.6	-0.6	14.9	36.3	50.7	63.3	70.2	65.7	53.8	34.5	11.5	-6.9	31.8
Mean daily minimum	-20	-12	5	26	40	53	61	58	44	26	4	-14	22
Mean daily maximum	0.5	7.9	31.1	51.0	66.2	72.7	81.7	78.6	63.7	48.3	19.4	-1.4	45.3
Absolute minimum	-41	-36	-26	-6	19	39	47	40	25	13	-24	-41	-41
Absolute maximum	28	38	54	77	88	99	104	97	90	77	52	42	104
Mean precipitation (in inches)	0.1	0.1	0.3	0.8	1.6	3.3	4.8	4.6	2.7	0.8	0.3	0.2	19.6
Mean no. of days with snowfall	4.0	2.2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.4	3.1	2.1	17
Mean depth of snow by 10-day periods (in inches)													
1st-10th	2.8	5.9	1.6	0	0	0	0	0	0	0	0	0	2.2
11th-20th	4.3	5.1	4.7	0	0	0	0	0	0	0	0	0.8	2.6
21st-30th	4.7	3.5	2.8	0	0	0	0	0	0	0	0.2	1.2	3.1
Mean precipitation (in inches)	0.2	0.2	0.2	0.7	1.3	2.8	4.2	5.4	2.7	0.5	0.3	0.2	18.7

Mazanovo
(51°39'N-129°02'E; Altitude, 5381)

Temperature (in °F)	Approved For Release : CIA-RDP62-00680R000200190077-3											Period of Observation (years)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
App. Mean	-17.1	-13.6	11.0	37.9	52.3	60.6	69.5	63.8	50.9	33.4	14.5	-19.5	28.2
Mean daily minimum	-27.4	-27.6	-4.5	26.4	37.9	49.3	58.1	54.5	41.1	23.4	-4.9	-31.4	16.2
Mean daily maximum	-9.3	-0.8	21.2	48.6	62.8	70.2	78.8	78.7	61.3	44.2	24.4	-11.4	39.1
Absolute minimum	-55.6	-59.1	-38.0	9.3	23.7	31.1	42.1	41.9	26.3	-0.4	-23.4	-44.3	-59.1
Absolute maximum	12	25	31	41	41	41	42	40	30	20	10	10	13
Mean precipitation (in inches)	0.2	0.2	0.2	0.7	1.3	2.8	4.2	5.4	2.7	0.5	0.3	0.2	18.7

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January 1979

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SUPPLEMENTARY GEOGRAPHIC INFORMATION ON THE MOZHAYSK AREA*1. Related Climatic and Soils Data

To supplement the previously presented information on the soils and climate of the Mozhaysk Area, the following additional data are given for soil and climatic conditions in the analogous Sobakino area under extremely severe winter conditions. The soil type at Sobakino is podzolic loam, similar to that found in parts of the study area. The observations, which were taken during the coldest winter in 60 years, are shown in Table 1. Changes of air and soil temperatures and the depth of snow cover through the winter months are given by 10-day intervals. For comparison, mean soil temperatures are shown for the same station in Table 2.

2. Additional Climatic Data

The mean dates of snow cover and mean monthly wind velocity for Mozhaysk are shown in Tables 3 and 4, respectively.

3. Hydrological Data

An earth dam on the Moskva River is to be completed in 1960, probably near the village of Kriushino ($55^{\circ}32'N$ - $35^{\circ}55'E$). The announced purpose of the dam and reservoir is to regulate the spring floods on the Moskva River and to provide an improved water supply for the city of Moscow. By raising the water level of the river approximately 66 feet (20 meters), it will create a reservoir about 12.5 miles (20 kilometers) long, inundating several small villages.

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In order to protect the land around Borodino, a barrier dam will have to be built at the entrance to the valley of the Koloch' River.

Additional hydrological data for the Mskva River at Mozhaysk indicate that on the basis of a 15-year record, the maximum spring discharge during the high-water period is at the rate of 425 cubic meters per second, whereas the average discharge is 280 cubic meters per second. The average date for the beginning of the high-water period is 29 March, and the high-water period continues for an average of 38 hours.

A 13-year hydrologic record is also available for the Protva River at Spas-Zagor'ye. The maximum spring discharge of the river is 570 cubic meters per second, whereas the average for this period is 403 cubic meters per second. The average date of the beginning of high water is 28 March and the high-water period lasts for an average of 44 hours.

4. Ground Water

There is no specific information on the ground water in the vicinity of the Mozhaysk Area. Well borings at various parts of the Moscow Basin, however, indicate that ground water would probably provide an ample water supply for the Mozhaysk site. A well boring slightly northwest of Moscow indicates that carbonaceous layers of the Upper and Middle Carboniferous strata yield ground water at 525 feet (160 meters) above sea level and that the hydrostatic level of this water maintains itself at a level 305 feet (93 meters) below the surface water. Since the carboniferous deposits lie nearer the surface at Mozhaysk, these strata would probably be encountered at depths of 100 and 230 feet (30 and 70 meters). The highest-yielding

water-bearing stratum is the Lower Cambrian Prribaltic aquifer that is probably found at a depth of about 4,400 feet (1350 meters) near Mozhaysk. It is estimated that the ground water from this aquifer has a hydrostatic level of about 820 feet (250 meters) below the lowest surface water level. No specific information on the chemical content or the yield of ground water for the Mozhaysk area is available.

Table 1: Climatic and soils Data for Sobokino Area,
(for the coldest winter in 60 years)

	<u>Dec</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>
Depth of Snow Cover (in inches)					
1st-10th	0	8.7	27.7	28.7	13.4
11th-20th	2.4	15.0	24.0	25.6	0
21st-30th	7.1	15.0	22.8	20.5	0
Mean Air Temp in °F					
1st-10th	31.3	-8.6	7.2	16.9	30.4
11th-20th	35.4	-7.9	5.9	20.3	31.5
21st-30th	6.6	4.1	16.5	25.3	36.3
Soil Temps at Depth of 20 inches in °F					
1st-10th	35.4	35.5	51.8	32.2	32.5
11th-20th	35.1	32.4	52.0	32.4	32.9
21st-30th	34.2	32.0	52.0	32.4	36.7
Soil Temps at Depth of 40 inches in °F					
1st-10th	38.5	36.1	44.3	34.0	33.8
11th-20th	37.3	35.2	44.2	34.0	33.3
21st-30th	36.9	34.9	44.0	34.2	36.0

Tables 2

Mean Soil Temperatures for Sobakino Area

Depth in Inches	Soil Temp. (°F.)											Cover Material	Under soil Temp. (°F.)	Natural Temp. (°F.)
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.			
29.8	30.0	31.1	37.0	32.5	60.8	66.7	63.0	52.2	42.6	35.6	30.9	44.4	44.1	44.1
30.7	30.7	31.3	35.2	50.2	58.8	64.6	61.7	53.2	42.8	37.6	32.2	44.6	44.6	44.6
32.4	31.6	31.8	34.0	47.6	56.3	62.1	61.0	54.0	54.0	54.0	54.0	39.4	33.3	33.3

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Snow Cover at Mozhaysk ($55^{\circ}30'N - 36^{\circ}0' E$) (15-year Period of Observation)

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GLYTR-C/I
January 1959

**SUPPLEMENTAL CLIMATE INFORMATION
VALDAY AREA**

1. Climatic Data

Climatic conditions at the Valday area are similar to those prevailing at the Mozhaysk area. The principal difference is the smaller range of temperatures between summer and winter in the Valday area. Minimum temperatures are not as low. Total annual precipitation is somewhat less, but the monthly distribution is much the same. Snow cover appears about a month earlier at Valday than at Mozhaysk, but it melts somewhat earlier in the spring. Also, cloudiness occurs more frequently at Valday.

Average monthly precipitation values and average and extreme depths of snow cover for Valday are shown in Table 1. Mean dates of snow cover are given in Table 2. Data are lacking on temperature and wind values for Valday but are given in Table 3 for the nearby station of Borovichi, located about 39 miles to the northwest of the selected point in the Valday area.

*This information supplements the data included in G/I-219, dated 17 April 1957.

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TABLE 1

Valday: 57059-N-33015'E

Average Precipitation in inches (25 years)	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
10.2	10.2	8.3	10.2	13.4	19.7	23.2	32.7	35.4	29.5	22.0	15.7	13.4	234.2
1-10th	12.6	17.3	21.3	32.2	0	-	-	-	-	0	0.8	4.7	
MEAN	14.6	18.9	21.3	3.9	0	-	-	-	-	0.4	1.6	6.7	
21-30th	15.4	20.5	18.9	0.3	0	-	-	-	-	0.4	3.1	9.4	
1-10th	27.1	34.3	36.6	31.9	2.2	-	-	-	-	0.4	5.9	13.0	
MEAN	33.2	35.5	35.4	26.5	0.4	-	-	-	-	0.6	2.8	18.5	
21-30th	30.7	39.8	32.3	31.8	0	-	-	-	-	1.6	8.7	23.2	
1-10th	5.1	7.5	10.6	0.4	0	-	-	-	-	0	0	0	
MEAN	5.5	9.8	5.1	0	0	-	-	-	-	0	0	0.8	
21-30th	5.3	10.0	6.3	0	0	-	-	-	-	0	0	3.3	

TABLE 2

Beginning of Snow Cover	End of Snow Cover	Average Number of Days with Snow Cover
Mean -- 26 October	Mean -- 22 April	161
earliest -- 4 October	earliest -- 5 April	
latest -- 27 November	latest -- 27 November	

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TABLE 3
Borovichi: 58°02'N-33°05'E (located 39 miles northeast of selected point)

	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
Mean Temp. (50 years)	15.1	15.8	23.2	38.1	51.6	59.2	63.3	59.2	49.6	38.5	28.2	18.9	38.5
Absolute Maximum Temp.													
in degrees F.	57.4	42.2	55.9	73.2	87.1	93.2	99.2	92.4	80.2	69.6	49.6	40.6	91.4
Approved Prevailing Wind													
Direction (11 years)	S	S	SSE	SSE	SW	W	W	W	SW	S	SSW	SSE	
Frequency (in Percent)	41-45	46-50	41-45	43-45	43-45	43-45	43-45	43-45	43-45	35	35	36-40	36-40
Approved Prevailing Wind													
Direction (11 years)	S	S	SSE	SSE	SW	W	W	W	SW	S	SSW	SSE	
Frequency (in Percent)	41-45	46-50	41-45	43-45	43-45	43-45	43-45	43-45	43-45	35	35	36-40	36-40

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2. Ground Water

Ground water provides an excellent water supply in the Valday area. Borings indicate that there is a minimum of 5 water-bearing strata that yield water ranging in quality from fresh to acrid. (1) The Quaternary deposits, at or near the surface in the Area, yield fresh and in places artesian water. (2) Below the Quaternary aquifer, the Lower Carboniferous and the upper surface of the Upper Devonian strata yield fresh artesian water from levels of 200 to 400 feet below the surface. (3) The carbonaceous aquifer of the Upper Devonian strata is found at depths of about 1,800 feet. This aquifer is covered by a capping layer of sandy-clay, yields acrid water with a high head, and has a hydrostatic level nearly comparable to that of the Quaternary deposits. (4) The Narov layer of the Middle Devonian, located at a depth of 2500 feet, yields highly mineralized water, the hydrostatic level of which rises to within 200 feet of the surface. (5) The deepest aquifer in the Valday area is the Lower Cambrian layer which is situated at a depth of 5000 feet. The hydrostatic level of the ground water from this stratum rises to within 500 feet of the surface.

Data are lacking on the chemical composition of the ground water or the volume of yield of specific strata. One source, however, indicates that one aquifer yields ground water having a high boron content (greater than 10 milligrams per liter).

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SPECIFIC GEOGRAPHIC ASPECTS OF THE OLENEGORSK AREA

CIA/RR-O/I 1945

13 January 1959

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January 1959

SPECIFIC GEOGRAPHIC ASPECTS OF THE OLENEGORSK AREA

The Area under consideration is the vicinity of a selected point at 68°15'N-33°55'E, about 16 miles northeast of the Olen'ya station (which serves the city of Olenegorsk) on the Murmansk-Petrozavodsk railroad. The Area lies about 55 miles (88 kilometers) south of Murmansk. Established transportation facilities -- the Murmansk railroad, the Murmansk-Lovozero road, and the Olen'ya airfield -- are easily accessible from the Area.

Although the Murmansk trunkline railroad is single tracked, the line is electrified and traffic is heavy. According to 1958 Soviet timetables, passenger traffic between Murmansk and Apatity (south of Murmansk) numbers 4 trains each way per day and 2 additional trains operating northward on Tuesday, Thursday, and Saturday, and southward on Monday, Wednesday, and Friday. A 1956 observation indicates that in addition to passenger trains there were three times as many freight trains operating on the line.

At the Olen'ya railroad station, a main stop on the Murmansk trunkline, is a small relay yard and turning point for engines. Eleven sidings -- 5 of which are electrified -- have been noted here. Three or four miles west of the Olen'ya railroad station are the Olenegorsk iron ore mines and the ore concentration plant, which are connected by a road and rail spur to the main trunkline. Midway between the railroad station and the mines is the growing city of Olenegorsk.

The main road between Murmansk and Lovozero passes less than 4 miles (6 kilometers) southwest of the selected point. From Murmansk southward to the vicinity of Pulozero, this road closely parallels the rail line, but runs entirely along the eastern bank of the Kola River. Opposite Pulozero, the road turns to the southeast, runs past the area, and then terminates at the rayon center of Lovozero. Access from the main road to the rail facilities at Pulozero and Olen'ya is provided by two connecting roads. One connecting road branches from the main road about 17 miles (22 kilometers) northwest of the Area, or about 3 miles (5 kilometers) southeast of Pulozero. The second connecting road intersects the main road about 7 miles (11 kilometers) south of the Area. Only recently has this road been shown on Soviet maps.

The airfield is located 12 miles (19 kilometers) southwest of the Area and about 3 miles (5 kilometers) east of the Olen'ya railroad station. The airfield is equipped with a 11,500-foot, hard-surfaced runway, which appears to be the longest on the Kola Peninsula. The installation is also equipped with a number of ancillary facilities. A road and probable rail spur connect the airfield with the main trunkline at Olen'ya. It is possible the Soviets have constructed a direct overland route between the airfield and the Area. Although several other airfields are located along the railroad north of Olen'ya, these facilities appear to be of secondary importance.

The Area is located in hilly terrain north of the Khibiny Mountains. The low, rolling hills are separated by marshes containing many lakes interconnected by small streams. Elevations in the area average 650 to 1,000 feet (200 to 300 meters) above sea level and

rise to 2,000 feet (600 meters) in the mountains east and north of the selected point. The numerous small streams form a meandering, irregular drainage pattern but, in general, they flow to the west toward Ozero (Lake) Pelesmozero (Permis-Ozero) and Ozero Kolozero (Kol-Ozero).

Within the Area are discontinuous stands of pine and spruce. Pine is found chiefly on the sandy, sandy-clay and podzolic soils of the valleys but sparse stands of pine with a ground cover of lichens (reindeer moss) are found on higher, drier areas such as hill tops and crags. Within the forests in some places are extensive marshy areas. Spruce grows at elevations up to 1,150 feet (350 meters) on sandy soils where subsurface water is near the ground surface. Lichens also cover the ground between the trees in the spruce stands. Small copse of birch mixed with bushes and lichens are found at higher elevations. The summits of the highest hills are devoid of vegetation except for patches of lichens, mosses, low bushes, and grasses. Tundra grass meadows are often found on the upper slopes of the hills. Stream valleys are covered with wet marshes of sphagnum mosses, bushes, and grasses interspersed with scattered copse of pine, spruce, or birch.

The minimum depth at which subsurface water can be obtained in quantity sufficient for water supply varies from several hundred to several thousand feet. Water is found at the greatest depths in the intermountain depressions and tectonic fault zones.

Geologically the entire Area is comprised of Pre-Cambrian rock, primarily Archean, overlain by a thin layer of recent, generally unconsolidated, deposits. This Archean rock includes olistoclastic

gneissic granites, granodiorites, hypersthene gneissic diorites, and migmatites, as well as a complex of micaceous and garnetized gneisses. A belt of granite intrusives extends to within three or four miles southeast of the selected point, and other plutonic intrusives are found immediately to the northeast. Two narrow belts, about 17 and 22 miles to the southwest, respectively, are a complex of Upper Archean or Proterozoic micaceous iron-bearing gneisses. The Pre-Cambrian rock underlying the lower elevations of the Area probably lies at an average depth of no more than 10 to 15 feet, with maximum depths rarely exceeding 75 to 100 feet. This depth decreases with an increase in elevation, and on the higher mountains -- above the 1,200- to 1,500-foot level -- the Pre-Cambrian rock is fully exposed.

In the southwestern part of the Area, 3 or 4 miles west of the Olen'ya railroad station, is the important Olenegorsk iron ore deposit and about seven miles further west, outside the Area, the smaller Kirovogorsk deposit.

Podzolic illuvial-humus soils predominate throughout most of the Area. In texture these are sandy loam and sand or, in places, gravelly with boulders. Mountain tundra soils are found at higher elevations. Isolated lenses of permafrost are scattered throughout the Area.

Sand and gravel are readily available everywhere. Near Ozero Lebyazh'ye and other lakes downstream from it there are extensive deposits of diatomaceous earth, useful in the manufacture of dynamite.

The climate of the Area, moderate for this Arctic latitude, is

continental in type, with short but warm summers and long severe winters.

The table on the following page shows average and extreme monthly temperatures and precipitation at the settlement of Imandra, 33 miles southwest of the selected point and some 600 to 800 feet lower in elevation. Temperature data are taken from a 20-year record and precipitation data from a 31-year record. Snow depth is shown by 10-day periods and the data are presumably based on a shorter period of observation.

The parts of the Area above the timberline are characterized throughout the year by fresh to strong winds and extremely unstable weather. Rain, snow, fog, storms, and clear skies give way in rapid succession to each other. North and northeast winds are most likely to bring unfavorable conditions. At an elevation of about 1300 feet the annual rainfall is 27 inches or more; both above and below this level rainfall decreases.

The beginning of winter in the Area is associated with frequent and sudden changes in the weather, including alternating periods of freezing and thawing. Heavy cloudiness is common. In late October or early November the rivers and lakes freeze over completely. Snow cover begins in mid-October and remains until late May, and the average maximum snow depth of 33 inches is in late March. Winter winds are predominantly from the south and southwest.

Glaze and rime constitute a major problem in the area. At Imandra these phenomena occur most frequently at the beginning and end of winter, November-December and April-May. Observations at Pulozero indicated a maximum rime thickness of 2.64 inches.

S-E-C-R-E-T

Tirmandra (67°04'N-33°22'E)
(425 Feet Above Sea Level)

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
Mean Air temp (°F)	8.6	9.7	15.8	23.4	37.4	40.4	56.1	52.3	43.3	31.6	20.7	13.5
Absolute Max temp (°F)	41.0	39.2	46.4	57.2	71.6	78.8	86.0	80.6	68.0	55.4	42.8	39.2
Absolute Min temp (°F)	-41.3	-49.0	-40.0	-25.6	3.2	23.0	24.8	28.4	15.8	-4.0	-32.8	-36.4
Mean Prec (in.)	.63	.55	.63	.75	1.30	1.69	1.97	2.48	2.32	1.85	1.22	.75
Max Prec (in.)	1.61	2.51	1.62	3.45	4.65	5.75	4.56	4.52	4.53	2.53	1.51	1.24
Min Prec (in.)	.16	.12	.28	.68	.39	.87	.43	.63	.52	.16	.43	.12
Depth of Snow cover in inches	1st-20th	28.9	25.2	20.5	30.7	18.1	0	0	0	0.4	3.5	14.4
For 10-day periods	11th-20th	20.1	26.8	31.5	29.9	29.8	0	0	0	0	2.2	17.1
No. days with Mean Min temp 0° or lower	21st-30th	21.7	27.6	32.7	24.4	2.0	0	0	0	2.0	9.8	26.9

Average annual precipitation at Pulozero (17 miles northwest of the area) 26 36.38 inches.

S-E-C-R-E-T

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The thawing ground of spring and the rains of spring and summer make most unpaved roads impassable. July is the only month during which no freezing weather is to be expected.

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S-A-C-R-E-T

Enough surface water is sourced from available within a relatively short distance of the selected point. In addition to about thirty small- and medium-sized lakes that lie within 10 miles, there are 2 large lakes and 1 medium-sized one which form a long north-south chain within 18 miles to the west, northwest, and southwest of the selected point. The mineral content, primarily calcium carbonate, of all water in the Area is less than 1 gram per liter.

Ozero Pelemonzero (Pernut-Ozero), the southernmost of the lakes and the only one which empties south into Ozero Ilimira, stretches in a north-south direction for about 3 miles, at no point exceeding 2 miles in width. Lying 459 feet (140 meters) above sea level, it covers an area of 9.3 square miles (24 square kilometers). Its average depth is 23 feet (7 meters); off the northern part of the east shore the bottom drops to 52 feet (16 meters) and in at least one place near the center to 75 feet (23 meters). At the southern end of the lake are shallow bays, 5 feet (1.5 meters) deep in the southwest and 14-23 feet (3 meters) in the southeast. The northern, western, and southern shores are for the most part marshy and boggy.

The highest water temperature recorded in Pelemonzero is 67°^{OF} (16.7°C). An 18-year record indicates that the average date of complete ice cover is 29 October but the actual dates range from 12 October to 13 November. The average date of break-up is 6 June, the earliest date 22 May, and the latest 20 June.

Ozero Kolozere, 459 feet (140 meters) above sea level in the headwaters of the Zola River, is a relatively large lake comprising 3 major arms. It stretches more than 11 miles from north to south and

about 4 miles from east to west, covering an area of 34.4 square miles (89 square kilometers). The maximum depth is 95 feet (29 meters).

During a 23-year period of observation the average date of complete ice cover was 29 October, with an extreme range from 12 October to 20 November. A 20-year record showed the ice breaking up between 18 May and 24 June, with an average date of 8 June.

Pulozero, 2 miles north of and 10 feet (3 meters) below Kolozero, is almost 7 miles long from north to south but less than a mile wide. It covers an area of about 4 square miles and reaches a maximum depth of 103 feet (31 meters). The maximum water temperature recorded in Orlov Bay, on the eastern shore, was 60°F . (15.5°C) at the surface in July. By September the surface temperature had dropped to 43°F . (6°C). On the basis of a 11-year record, the average date of complete ice cover is 14 November, although actual dates range from 13 October to 15 December. The dates of ice breakup during an 18-year period ranged from 11 May to 26 June with an average date of 29 May.

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